Fossil Mammals of Africa

No. 6

THE MIOCENE AND PLEISTOCENE LAGOMORPHA OF EAST AFRICA

BY

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With 1 plate and 26 figures in the text

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CONTENTS

INTRODUCTION

The material to be described has been accumulated from various localities in East Africa over the last twenty years. Much of the collecting was made possible by financial grants from the Kenya Government and the Royal Society, and by donations from C. W. Boise, Esq.

The Miocene material includes a new genus of the Ochotonidae with two new species, represented by numerous fragments from the Lower Miocene deposits of Rusinga Island,* and a few examples from Karungu and Mfwangano. Up to the present no specimens of this group have been found in the mainland Miocene deposits of Songhor and Koru.

The Rusinga material comprises some 340 specimens of both species from known sites, of which two come from the lowest levels—Shackleton's Kiahera series (Shackleton, 1951); 64 (18·7%) from the Lower Hiwegi series; 88 (25·8%) from the Upper Hiwegi beds, and 187 (54·8%) from the Kathwanga series. This may suggest (unless there were differences in conditions of preservation) that the animals were increasing in numbers from the earliest period represented, either by direct increase, or by a gradual change in the ecological conditions, which may have resulted in a more favourable environment.

In addition to the Miocene genus, a collection of fossils from the Pleistocene deposits of Lake Eyasi in Tanganyika Territory includes some material assigned to *Serengetilagus* Dietrich.

A new species of *Lepus* is also described from the Pleistocene deposits of Uyoma and Kanjera, in the Kavirondo Gulf area of Victoria Nyanza.

The material from Kanjera and Lake Eyasi was collected by the East African Archaeological Expedition of 1935 and deposited in the British Museum (Nat. Hist.). All the Miocene material, and also the holotype of the new *Lepus*, is at present housed at the Coryndon Memorial Museum, Nairobi.

* For evidence of the age of the deposits, see Le Gros Clark & Leakey, 1951: 4-6.

Explanation of terms and procedure

For the purposes of diagnoses and comparisons in this paper, the second upper pre-molar and the third lower molar are generally omitted from the Pm–M series since they are so seldom preserved.

The majority of the measurements have been taken by means of a micrometer eyepiece, the specimen being set with the surface to be measured as nearly horizontal as possible. Measurements of the teeth were taken at the occlusal surface unless otherwise stated. The term "breadth" means the maximum transverse diameter of the widest lobe of the tooth; "length" means the maximum antero-posterior diameter at right-angles to "breadth", and is, therefore, not necessarily parallel to the long axis of the skull.

In the diagrams, stippled areas represent matrix, remaining where the bone surface has been broken away, or else filling empty tooth sockets; in diagrams of the Leporidae, stippling denotes cement.

The term "gingival level" is used to denote the level to which the tooth is set in the socket.

Apart from published figures and descriptions, the only specimen of a Recent *Ochotona* available for comparison was a skull referred to *O. wardi* Bonhote, labelled "N. W. Province, India", provided by the Department of Zoology of the British Museum. Comparisons were also made with skulls of *Lepus europaeus*, *Lepus capensis*, *Pronolagus crassicaudatus* and *Oryctolagus cuniculus*.

Order Lagomorpha

Family OCHOTONIDAE

KENYALAGOMYS gen. nov.

DIAGNOSIS.—An Ochotonid with the dental formula $\dfrac{2.\ 0.\ 3.\ 2}{1.\ 0.\ 2\text{--}3.\ 3}$. Upper Pm³ trapezoidal in section, with a deep V-shaped fold of enamel from the antero-external border, occupying most of the crown. Lower Pm_3 with deep enamel fold from the antero-external border, and a shallow fold on the anterior border. Lower M_3 simple.

TYPE SPECIES.—*Kenyalagomys rusingae* sp. nov.

Kenyalagomys rusingae sp. nov.

(Pl. 1, figs. 1–6; Text-figs. 1–5, 7, 8, 10, 12, 13)

DIAGNOSIS.—A species of *Kenyalagomys* in which the pre-molar formula is $\dfrac{3}{2}$. Length of upper Pm³–M² more than 9 mm. Length of lower Pm_3–M_2 not less than 8·75 mm. Supra-occipital occupying 8% or more of the dorsal length of the skull. Anterior palatal fenestrae separated by a median septum of bone.

SYNTYPES.—A skull fragment, including the left half of the mandible (No. 370 '52), bearing a nearly complete dentition (Text-figs. 1 & 2, and Pl. 1, figs. 1 & 2), and a complete skull and mandible (No. 592 '52.   Pl. 1, figs. 3–6).

PARATYPES.—A left maxilla (No. 793 '47) bearing the complete pre-molar–molar series, and two halves of a mandible thought to be of a single individual (Nos. 977 '47 and 980 '47), with examples of the entire lower dentition.

The bulk of this paper was completed and ready for publication prior to the discovery of the second syntype, No. 592 '52.   Although the latter is more complete than No. 370 '52, which at that time had been chosen as holotype, it has been decided to regard both specimens as syntypes, and thus obviate the necessity for attempting to remove the mandible from the more complete skull, since this would almost certainly cause severe, if not irreparable damage to the specimen.   Moreover the external structure of the maxilla is less well preserved in No. 592 '52, and most of the essential details of the occipital region can be seen despite the remaining matrix by which the mandible is cemented to the skull.   In consequence, the description of the muzzle, palate and dentition is based largely on No. 370 '52, whilst that of the posterior part of the skull is taken from the second specimen.   The paratypes have been retained, since they show certain features more clearly, particularly the structure of the anterior upper pre-molar, and of the lingual surface of the mandible.   Text-fig. 3 is a composite drawing based on both the syntypes, and corrected for any obvious distortion of the originals.

HORIZON.—Lower Miocene.

LOCALITY.—(Syntypes) Gumba Peninsula, Rusinga Island, Victoria Nyanza, Kenya Colony.   Lat. 0° 25' S. ; Long. 34° 7' E.   The site from which the syntypes were obtained is in deposits younger than the main Kiahera series, and probably equivalent in age to the Kathwanga series.

MATERIAL.—In addition to the syntypes and paratypes the material consists almost entirely of fragments of maxillae and mandibles; the latter predominate in the proportion of about 4 : 1 in a total of 347 specimens, of which 30 are surface finds. The details of the known levels from which the material was obtained are as follows:

<div align="center">

168 from sites in the Kathwanga series.

85　,,　　,, ,, ,,　Upper Hiwegi series.

62　,,　　,, ,, ,,　Lower Hiwegi series.

2　,,　　,, ,, ,,　Kiahera series.

</div>

DESCRIPTION.—No. 370 '52 comprises the face and palate of an adult animal, including the greater part of the orbits, but lacking the whole of the cranial region (Text-fig. 1).   No. 592 '52 is more complete, with the cranium preserved and with the mandible cemented in position by the hard matrix.   The left mandibular ramus was originally attached to skull No. 370 '52, but the posterior part of the ascending ramus including the mandibular angle and the condyle is missing, and it was possible to remove the ramus without damage so that the palatal and dental structure might be studied (Text-fig. 2).   The missing left upper M^1 of this specimen had slipped from the alveolus shortly after death, and was found embedded in the matrix beside the lower cheek-teeth during the course of preparation.   The right upper M^1 is attached,

but not in its true position, having slipped half way out of the socket.   The other missing teeth were not recovered.

Nasals.—The nasals are preserved only in the syntypes, and in both are somewhat crushed, but they appear to have projected further forward than those of *Ochotona*. Posteriorly they terminate just in front of a line connecting the anterior margins of the orbits, whereas in the modern genus they extend well behind this line.   The posterior ends are rounded, and the lateral margins are not produced backwards as in the leporids.   In spite of distortion it appears that the two bones were practically parallel, and thus intermediate between the conditions found in *Ochotona* and *Lepus*.

Frontals.—Anteriorly the two frontals project very slightly forward in the middle line into the shallow V formed by the posterior border of the nasals.   Laterally a long, slender process extends forwards between the pre-maxillae and maxillae for about half the total length of the muzzle.   In *Ochotona wardi* the frontals are slightly arched, in profile, between the orbits, whereas in the fossil they continue the general line of the nasals.   The upper margin of the orbit is compressed into a sharp, slightly up-raised flange, so that the space between the orbits is distinctly concave transversely.   There is no trace of any supra-orbital process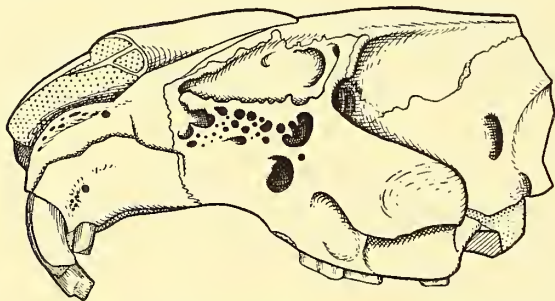 of the frontals.   Posteriorly the fronto-parietal suture is damaged in both specimens, but it appears to have been almost straight across the vault at the level of the front of the glenoid fossa, with a very slight backward projection in the middle line. Postero-externally the frontals meet the squamosals just behind the orbital margin.   The fronto-lachrymal suture is somewhat obscured, but it appears that the lachrymal is separated from the orbito-sphenoid by a process from the maxilla, as in the leporids, rather than by a process from the frontal.

FIG. 1.   *Kenyalagomys rusingae*: syntype (370 ’52).   ×2.

A small part of the left *lachrymal* is present in 370 ’52; it appears to have been very similar to that of *Lepus*, but the lateral process does not extend appreciably beyond the general level of the orbit, and the antero-inferior corner is truncated. The bone from the right side of No. 370 ’52, and both those of No. 592 ’52 were evidently lost very soon after death, as so commonly happens in modern forms.

Parietals.—Anteriorly the parietals are somewhat inflated, but whereas in *Ochotona* the posterior part slopes gently down to the occipital suture, in *Kenyalagomys* there is a deep depression behind the inflated area.   This is bounded posteriorly by a ridge along the occipital suture, and medially by a distinct crest along the extreme posterior end of the sagittal parietal suture (Pl. **1**, fig. 4).   There appears to be no trace of any interparietal bone, but it is possible that the sutures have been obliterated by age.

The *supra-occipital* extends back in approximately the same plane as the parietals for a distance of about 5 mm., to a very sharp flange of bone forming a second occipital crest parallel to, but more pronounced than the true occipital crest along the parieto-occipital suture.   Wood refers (1940 : 281) to the "invasion" of the dorsal surface

of the skull by the supra-occipital as a leporid specialization since it is entirely absent in *Ochotona*, but *Kenyalagomys* does not support his view, for the supra-occipital occupies 8·4% of the total length of the dorsal surface, compared with about 9·0% in the leporids. The dorsal part of the supra-occipital passes down in a smooth curve on either side towards the bullae, and there is no trace of the quadrate median table found in this region in some of the modern leporids. The occiput is almost vertical, and considerably higher than that of *Ochotona*—approaching the condition found in the leporids, but lacking the lateral constriction. There is a conspicuous vertical keel from the crest to the foramen magnum, as in the leporids but not in *Ochotona* (Pl. I, fig. 6). This however is probably a normal development associated with a strengthening of the neck muscles, but it is interesting to note that it is well developed in most saltatorial mammals and absent in purely fossorial forms. According to Wood, the strengthening of the neck muscles in the leporids occurred as a jumping adaptation, and if this be so it is possible that the semi-fossorial habits of *Oryctolagus* are a more recent development. The general similarity of the occipital region in *Kenyalagomys* and the Recent leporids suggests that the former was also saltatorial to much the same extent, and certainly more so than the Recent ochotonids.

The *pre-maxillae* are relatively deeper than those of *Lepus* and *Ochotona*, and the upper incisors form the arc of a smaller circle than in either of the modern genera, and are thus inclined to be more opisthodont. The postero-dorsal process is similar to that of the ochotonids and ends well forward of the posterior point of the nasals. Anteriorly the pre-maxillae are in close contact with the nasal bones for practically their whole length, and the deep notch usually present in the leporids is not apparent. The lateral walls of the two bones are practically parallel as in *Ochotona*. At the antero-dorsal surface the bone curves over the top of the incisor, and thence sharply upwards to meet the lower border of the nasal. The shallow trough so formed has a cluster of nutritive foramina, and a smaller cluster occurs on the lateral wall just above the alveolus of the incisors.

Maxillae.—On the lateral surface of the maxilla a large triangular vacuity is present immediately in front of the orbit, as in *Ochotona*. In the latter, the lower border of the vacuity is formed by a smooth bony plate, whereas in the fossil the lower border is considerably serrated, suggesting that the vacuity may have been partially covered by a bony net-work, as in the leporids. Moreover, below the main vacuity a conspicuous series of foramina, in addition to the smaller anterior vacuity of *Ochotona*, strengthens the impression of a net-work on the outer surface of the maxilla (see Text-fig. 1). In *Ochotona* there is a single infra-orbital foramen situated just below and in front of the antero-inferior margin of the orbit, and mid way between the superior vacuity and the alveolus of Pm². In the fossil this space is occupied by two large foramina, of which the lower is slightly in advance of the upper. The proportions of this part of the skull are somewhat different from those of *Ochotona wardi*, in which species the superior vacuity occupies more than half the total depth of the maxilla, whereas in *Kenyalagomys* it occupies appreciably less than half the depth. This is owing to the relatively greater depth of the pre-maxilla and maxilla of the fossil, in which the size of the vacuity in relation to the length of the skull remains approximately similar.

The anterior end of the zygomatic arch arises in a simple, slightly convex curve

from the maxillary surface, with no trace of the anterior pit characteristic of at least some of the Leporidae. The front part of the zygomatic process forms an anterior angle of 45° with the general horizontal line of the cheek-teeth; a condition very similar to that found in *Eurymylus* (Wood, 1942). In *Ochotona* this angle is about 60° and in *Lepus* it appears to vary from about 85°–95°. This seems to be due to the bending of the facial axis, which brings the anterior rim of the orbit back to a point over Pm^4 in *Lepus*, whereas in the ochotonids it lies over, or in front of, Pm^2. The whole anterior part of the zygomatic process is much more massive in *Kenyalagomys* than in *Ochotona*, owing to the greater relative size and hypsodonty of the cheek-teeth. In *Ochotona* the position of all the cheek-teeth except the anterior pre-molar is clearly visible inside the orbit, since each is covered by a thin layer of bone, and the alveoli are separated by distinct grooves. Moreover the arch arises from the middle of the penultimate tooth, which does not reach to the zygomatic, whilst the last molar falls short of it by about 2 mm. In *Kenyalagomys* on the other hand the roots of all the cheek-teeth, including that of the third molar, extend into the arch, and the grooves between the sockets are scarcely visible inside the orbit.

FIG. 2. *Kenyalagomys rusingae*: syntype No. 370 '52. Palate, after removal of mandible. ×2.

The *malar* is completely fused to the maxilla, and the position of the suture is uncertain, but externally it was probably immediately in front of the masseteric groove. In No. 592 '52 and certain other fragments in the collection the anterior end of the masseteric groove is clearly shown on the outer surface of the zygomatic arch; it arises above Pm^4, and forms a wide rounded depression bounded by a sharp ridge. This feature appears to have been constant. The upper part of the ridge bounding the groove extends back horizontally across the arch. Posteriorly the malar is produced backwards as a long, slender process overlying the ascending ramus of the mandible immediately below the condyle (see Pl. 1, fig. 3). This is very similar to the condition found in *Ochotona* although slightly less specialized, since in the modern genus the process extends almost to the external auditory meatus. The malar-squamosal suture is clearly visible just below the level of the mandibular condyle, as in the Recent forms. The main shaft of the malar is very much flattened, particularly in its lower half, to form a deep vertical plate. In *Ochotona*, and also in the Recent leporids, taking the general line of the cheek-teeth as the horizontal, the lowest part of the orbit is at the antero-inferior point. In *Kenyalagomys* the inferior margin of the orbit is practically horizontal, with the lowest point, particularly in No. 370 '52, over the last molar.

Palate.—The reduction of the hard palate is approximately similar in *Kenyalagomys* and *Ochotona* except that the former, as one might expect, is less specialized than the latter. The palatine fenestrae end posteriorly at the level of the Pm^{3-4} junction, slightly further forward than in *Ochotona*. In No. 592 '52 the fenestrae

are completely separated in the middle line by a slender, but continuous, septum of bone arising from the anterior palatal wall of the maxillae (see Pl. 1, fig. 5), and extending forwards to the incisors. This is presumably formed by median anterior processes of the maxillae, uniting with the corresponding backward processes of the pre-maxillae, but the point of contact is entirely obliterated. The septum is not visible in No. 370 '52 owing to post-mortem damage, but there is no reason to suppose that it was not originally present. This condition is quite unlike that of *Ochotona*, in which there is no trace of any median anterior process from the palatal portion of the maxilla. In the leporids this process is present, forming a sharp anterior point in the middle line, but it is not continuous with that from the pre-maxillae. This feature probably represents a less-specialized condition than that of the ochotonids, but the somewhat greater resemblance to that found in the leporids does not necessarily indicate closer affinity to the latter. The foramen premolare which, as Bohlin (1942*a*) pointed out, appears to be characteristic of the Ochotonidae, is present in every specimen in which this region is preserved, and is situated almost at the alveolus at
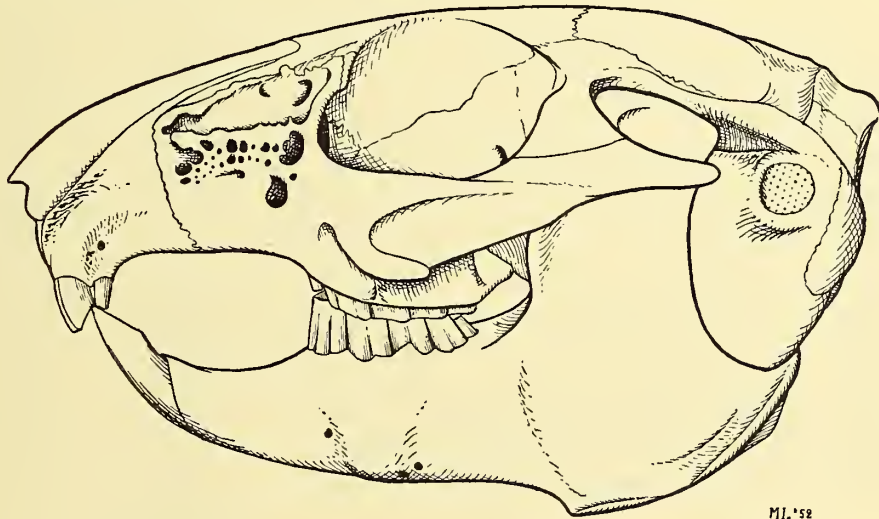
FIG. 3. *Kenyalagomys rusingae*: Restoration. ×2.

the level of the Pm$^{3-4}$ junction (see Pl. 1, fig. 2). There is no indication in any example of the socket for a rudimentary M^3, which according to Bohlin is sometimes present in *Sinolagomys*.

The *palatines* are similar to those of *Ochotona*, and the suture separating them from the maxillae runs practically straight across at the level of the Pm^4–M^1 junction. The aperture of the posterior nares is very narrow, as in *Ochotona*, and extends forwards to the level of M^1, and the transverse bony plate of the palate measures 4 mm. in length.

The sutures within the orbit are largely obliterated, and the exact outline of the bones cannot be determined with certainty. The position of the optic foramen is slightly more posterior than in *Ochotona*, and whereas in the Recent genus and in the leporids the two foramina unite to form a conspicuous inter-orbital fenestra, in *Kenyalagomys* this feature was scarcely developed.

The *squamosal* is largely hidden by the mandible and the connecting matrix,

2

but the exposed portion is very similar to that of the Recent ochotonids. Postero-dorsally it is raised into a prominent ridge along the parieto-squamosal suture, as in some of the leporids.

The *bulla* is relatively much larger than that of *Lepus*, and although less evenly inflated it is appreciably deeper than that of *Ochotona*. Dorsally the upper part of the bulla and the meatal tube are both very similar to those of *Ochotona*, but ventrally the bullae are more compressed, and more widely separated across the basi-cranial region.

The *mastoid* appears to extend up on to the dorsal surface of the skull as in *Lepus*, but the sutures are not clearly defined in this region.

The *foramen magnum* is somewhat more similar to that of *Lepus* than that of *Ochotona*, but lacks the marked upward extension into the occiput, being thus more or less circular rather than pear-shaped. The occipital condyles are widely divergent, and are connected ventrally by a distinct ridge which falls below the basi-cranial level and unites with the prominent median ridge of the basi-occipital.

The dimensions of the syntypes, in millimetres, are:

	370 '52	592 '52
Maximum length of specimen	38·5	58·0
Condylo-basal length	—	52·5
Nasal length	21·0+	22·0
Maximum breadth across brain-case	—	19·0
Zygomatic breadth	27·5	27·5
Meatal breadth	—	24·25
Condylar breadth	—	11·75
Inter-orbital constriction	8·5	8·0+
Length from I^1–M^2 inclusive	27·5	27·5
Length of diastema	12·0	12·5
Alveolar length (Pm^2–M^2 inclusive)	12·5	12·0
Maximum external palatal width (at Pm^4)	19·0	19·5
Internal palatal breadth at Pm^2	8·5	9·0
,, ,, ,, ,, M^2	9·25	—

Upper dentition.—In No. 370 '52 the incisors are somewhat damaged, particularly those of the left side, and the first incisor of the right side is displaced, having slipped partially out of the socket. In the other syntype (No. 592 '52) the second incisor of the right side is missing, but the others are fairly well preserved. A few isolated incisor teeth are also included in the collection. Pm^2 is missing from both sides of No. 370 '52, but is undamaged on the right side of No. 592 '52 and in the paratype maxilla. The remaining cheek-teeth are well represented in both the syntypes and in numerous other maxillary fragments in the collection.

The first incisor is somewhat compressed antero-posteriorly, and is deeply grooved down the middle of the anterior surface. The median lobe is slightly deeper from front to back than the lateral lobe, and the postero-internal corner is almost a right-angle. The general curvature of the incisor is more pronounced, and the tooth thus more opisthodont than that of *Ochotona wardi*, since the incisive index (Thomas, 1919) is 75°, compared with 83° in the Recent species. On the other hand, in the leporids the index is distinctly variable; the range from 75° to nearly 90° appears to depend

upon the age of the individual, and thus indicates that no greater significance should be attached to this feature.

The second incisor projects about 2 mm. from the alveolus, and is mainly oval in section, with longer axis transverse. In No. 592 '52 there is a slight indentation of the enamel wall at the postero-external edge, but this does not appear to be a constant feature. The transverse section of two upper incisors is shown in Text-fig. 5, and the measurements, in millimetres, are:

	370 '52		592 '52	
	I^1	I^2	I^1	I^2
Antero-posterior length	1·5	0·75	1·8	0·8
Transverse breadth	2·5	1·0	2·5	1·3

The collection includes a further 70 maxillary fragments, but of these, only the paratype has the complete Pm–M series present in a more or less undamaged condition (Text-fig. 8). Nearly all the other examples have lost Pm², and have the outer margins of the remaining teeth damaged.

Pm² is reduced to a simple peg, transversely oval in section, with a very slight indentation of the enamel of the anterior surface. In this respect the tooth differs from that of *Austrolagomys inexpectatus* Stromer, but a slight increase in wear would eliminate this feature, which does not persist to the alveolus.

Pm³ is somewhat trapezoidal in outline, and distinctly less triangular than the corresponding tooth of *Austrolagomys*, by reason of a more pronounced antero-internal corner. The inner surface of the tooth is divided into two lobes by a deep enamel fold which is partially filled with cement. A conspicuous V-shaped fold originating near the antero-external corner extends inwards into the base of the antero-internal lobe, and thence bends sharply backwards and outwards towards the postero-external corner. This fold is filled with cement, and is still present near the extreme base of the tooth, as shown by sections cut through some of the less well-preserved fragments. According to Stromer this crescentic or V-shaped fold is entirely absent in Pm³ of *A. inexpectatus*, in which there are two very shallow indentations on the antero-external enamel surface.

Pm⁴ is molariform and consists of two transversely oval lobes, of which the anterior is somewhat the broader, separated by a deep, narrow fold of the enamel of the inner wall, extending across about two-thirds of the breadth of the tooth. The outer margins of the teeth are damaged in nearly every case, and it is thus impossible to determine with certainty the exact form of the enamel in the outer portion of the crown. It appears, however, that there was a shallow inward fold, which was probably filled with cement. This is supported by sections, in which a distinct indentation of the enamel can be seen. The enamel of the anterior wall of the tooth, and that of the anterior wall of the hind lobe (i.e. the posterior wall of the tranverse median fold), is appreciably thicker than that of the posterior wall of each lobe. This produces the characteristic form of wear, in which the anterior walls of the lobes stand up as pronounced transverse ridges. The corresponding ridges of the lower teeth wear the dentine of the upper teeth into a similar form even in the outer portion where the two lobes are united, and it is thus difficult to determine the exact point at which the transverse fold ends.

M¹ and M² are almost identical in structure to Pm⁴, with the transverse fold extending somewhat further across the crown; fully three-quarters of the breadth, in M¹. The posterior lobe of M² is distinctly narrower than the preceding lobe, as is the case in *Austrolagomys*.

The enamel pattern of the upper cheek-teeth is shown diagrammatically in Text-figs. 7–8. The measurements of the upper cheek-teeth of the syntypes and paratype, in millimetres, are as follows:

	Pm²		Pm³		Pm⁴		M¹		M²		Pm³–M²
	Lgth	Bdth	Lgth	Bdth	Lgth	Bdth	Lgth	Bdth	Lgth	Bdth	Lgth
370 '52	—	—	2·0	4·1	2·0	3·75	2·2	3·75	2·0	3·1	9·5
592 '52	0·8	1·4	2·1	4·0	2·0	4·25	2·1	4·0	2·0	3·0	9·25
793 '47	0·8	1·6	1·75	3·8	2·0	3·9	2·1	3·7	2·0	2·8	9·5

The breadth measurements represent the maximum transverse breadth of the widest lobe at the occlusal surface. Length measurements are the maximum a–p diameter approximately at right-angles to the breadth axis. The discrepancy between the added lengths and the total for the series is due partly to the oblique angles, and also to the spaces between the teeth. According to Stromer's measurements of *A. inexpectatus* (1926 : 127), Pm³ is 2·5 mm. in length, and thus appreciably longer than any other tooth. It is apparent, however, from his figure of the upper teeth, that this is not the case, and the measurement of the figure reduced in proportion to the enlargement gives a length of 1·5 mm., which suggests a typographical error. Alternatively Stromer's "length" is taken in a different plane. In *Kenyalagomys* the maximum breadth is generally across the posterior lobe, but the difference is extremely slight and is not constant.

Mandible.—The collection includes 272 tooth-bearing fragments of mandible, but no specimen is quite complete. That of the left side of No. 592 '52 is broken across the middle of the diastema and the anterior part is missing, whilst the other most nearly complete examples are those of No. 370 '52 and of the paratypes, which lack only the posterior portions of the mandibular angles and the ascending ramus. Text-fig. 4 is a composite drawing made from several specimens, to show the structure of the lingual surface.

The mandible is somewhat similar to that of *Ochotona*, but the ascending ramus is more vertical, and whereas in the Recent genus the greatest depth of the horizontal ramus is at the anterior end of the tooth-row, in *Kenyalagomys* the depth increases towards the posterior end. In the Recent leporids the depth of the ramus again increases slightly towards the back. On the external surface there is no single mental foramen, but at least two main foramina are present in every example in which this region is preserved, and in certain specimens these are surrounded by numerous smaller subsidiary foramina, all of which are presumably for the passage of blood-vessels. Of the two main foramina, the anterior lies fairly deep below Pm₃, whilst the second lies deeper (rather more than ¾ of the total depth of the ramus) below M₁, and may be divided into two distinct parts (Text-fig. 3). In *Lagomys* and *Ochotona* a single foramen is present below the last molar, but the anterior foramen is absent. In *Myolagus* the two foramina are similar to those of *Kenyalagomys*, but the tooth pattern, particularly of Pm₄, is very different.

The anterior border of the ascending ramus consists of a distinct groove bounded by prominent flanges, and the coronoid process is derived, as in the leporids, from the outer flange, and curves inwards across the groove. This is entirely different from *Ochotona*, in which the coronoid is represented by a tubercle in the middle of the relatively flat anterior edge. The upper branch of the foramen mandibulare penetrates the inner flange of the ascending ramus immediately behind the third molar. The articular surface of the condyle occupies practically the whole of the upper surface as in the leporids, and not only the anterior part as in *Ochotona*. The posterior edge of the ascending ramus lies close against the bulla in a smooth curve to the level of the lower cheek-teeth, and thence in a sharper curve backwards and upwards to the angle. The angular process as a whole is relatively much larger than that of *Ochotona*, and not unlike that of *Lepus*, though less rounded. Anteriorly it diverges from the base of the horizontal ramus at a point considerably behind the level of the third molar, although not so far back as in *O. wardi*. Immediately behind this anterior angle of the process the lower border forms a wide, flat surface curving gently up to
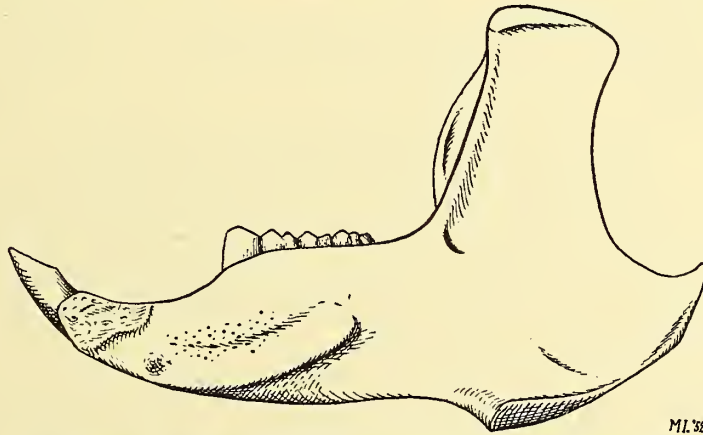
FIG. 4. *Kenyalagomys rusingae*: Right mandibular ramus; lingual aspect. ×2.

the true mandibular angle, and separated from the body of the ascending ramus by sharp, lateral ridges. The masseteric fossa is more similar to that of the leporids than to that of the ochotonids, extending to the postero-inferior margin. In both the syntypes there is a distinct curved ridge in the lower part of the fossa, approximately parallel to the edge of the bone. This is particularly well marked in No. 592 '52, and is presumably for the insertion of the masseter lateralis profundus (Pl. 1, fig. 3).

On the lingual surface of the horizontal ramus the posterior part of the incisor root-socket forms a massive curved ridge (Text-fig. 4). This first becomes apparent below the anterior pre-molar, and increases in strength as it passes backwards to end abruptly at a point approximately below the posterior end of the second molar. The surface of the bone forming the anterior part of the ridge is covered with a net-work of nutritive foramina. In *Ochotona wardi* the ridge of the lower incisor ends below Pm_4, and is much less pronounced ; in the leporids it ends in front of the anterior pre-molar, and produces only a very slight swelling. Longitudinal and transverse sections through two of the mandibular fragments show that the anterior pre-molar was short

and the incisor passed beneath it. Pm_4, as in the leporids, is almost straight, overlapping the incisor on the labial side and extending to the lower margin of the ramus, where it forms a distinct tubercle on the outer surface (Text-fig. 3). This arrangement arises from the greater length of the lower incisor and the relatively shorter diastema in the fossil. The main aperture of the foramen mandibulare is slightly below that of *Ochotona*, but not well below the level of the tooth-row as in the leporids.

The dimensions of the mandibles of syntype No. 592 '52 and paratype No. 977 '47, in millimetres, are:

	592 '52	977 '47
Total length (incisor tip to angle)	45	45*
Length of pre-molar–molar series	11·5	11
Length of diastema	9	9
Depth of ramus at Pm_3	8	8
Depth of ramus at M_3	10·5	11·25
Height of ascending ramus	27·75	27*
A-p width of ascending ramus including coronoid .	12	—
Length of condyle	8	—
Length of incisor (tip to tip; straight)	—	24

* denotes that the measurement is estimated.

Apart from the syntypes and paratypes very few of the mandibular fragments are sufficiently complete for the ratio of diastema to lower cheek-teeth to be determined, but where determination is possible the ratio is found to vary from 81 to 90. This is in substantial agreement with the values given by Bohlin for the ochotonids, and is appreciably lower than those of the leporids.

Lower dentition.—In cross section the lower incisor is roughly in the form of an isosceles triangle with rounded corners, and with the shorter base to the front (Text-fig. 10). The posterior angle is somewhat truncated, and there is a slight indication of the flattened condition which is found in the Recent lagomorphs. The enamel appears to be continuous all round the tooth, but it is extremely thin around the posterior margin. Although *Kenyalagomys* was distinctly smaller than a full-grown example of *Lepus capensis*, the complete lower incisors vary from 22 to 24 mm. in length (measured in a straight line from tip to tip), whereas the same measurement in twelve specimens of the Recent species examined ranged from 23 to 26 mm. The antero-posterior depth of the incisor at the alveolar level is 2·3 mm., and the transverse breadth 2·6 mm. compared with 2·5 × 3·1 mm. in *L. capensis*.

Pm_3 is more or less triangular in section, with a short antero-internal face, a long antero-external face and a slightly longer posterior face. The enamel of the posterior wall is very slightly convex towards the back; that of the antero-internal wall may be straight or bent inwards into a shallow fold, whereas the antero-external wall has two deeper and more compressed folds. Apparently the whole of the outside of the tooth was encased in cement, and the enamel is exposed only in those places where the cement is worn off the more prominent ridges. Comparison of this tooth with Pm_3 of *Austrolagomys inexpectatus* is difficult because Stromer's description (1926: 128, pl. 40, fig. 16a) does not altogether agree with his figure of the lower teeth. The

figure shows a slightly concave enamel surface on the anterior and inner walls, with a small enamel island near the middle of the latter; a convex posterior wall, and on the external wall a fairly deep fold near the front, which is directed inwards and slightly backwards, with a distinct indentation of the enamel surface to the posterior part of the outer wall. In the text, however, Stromer stated that Pm_3 shows nothing of the deep enamel fold of other Ochotonidae except a very shallow fold in front, and a somewhat stronger one, filled with cement, on the inner side. He mentioned neither the conspicuous fold on the outer surface, nor the isolated enamel island near the inner wall.

Pm_4, M_1 and M_2 are very similar to one another in general structure; they consist of two distinct transverse lobes, the trigonid and talonid, which are apparently united only by cement. One fragment of a mandible was ground away transversely from the lower border of the ramus upwards, and no trace of any junction in the enamel of the two pillars could be found. The trigonid of each tooth is somewhat lozenge-shaped; the anterior wall is slightly convex on the inner half and concave on the outer, whereas the posterior wall of the lobe is concave on both sides of the central backward projection. The change from the convex inner half to the concave outer half of each anterior wall becomes progressively more pronounced in each tooth, and sometimes forms almost a right-angle in the second molar (Text-fig. 13). The posterior lobe of each tooth is more compressed antero-posteriorly, with a smoothly convex posterior wall. The anterior wall is again slightly concave in the outer half and convex on the inner, but the transition is more gradual than in the trigonids. The outer angle of each lobe is compressed into a sharp edge, whilst the inner is more rounded. As in Pm_3, a thin coating of cement covers almost all the enamel, thickening slightly towards the middle, but leaving the valleys distinct. The enamel is exposed only on the posterior wall of M_2, and on some of the sharper internal angles, but this may be due to post-mortem weathering. The enamel of the posterior wall of each lobe is considerably thicker than that of the anterior wall, so that in wear the former stands up as a pronounced ridge. This is the reverse of the condition found in the upper teeth, in which the enamel of the anterior wall of each lobe is thicker than that of the posterior wall.

M_3 is damaged in almost every example, but is well preserved in the mandible of syntype No. 370 '52. It consists of a simple peg, slightly compressed from front to back into a somewhat rounded oval. On the posterior wall there is a very shallow, cement-filled indentation of the enamel, but no other sign of folding.

The enamel patterns of the lower cheek-teeth of the syntype No. 370 '52, and of paratype No. 977 '47 are represented diagrammatically in Text-figs. 12, 13.

A vertical longitudinal section through a fragment of mandible bearing the cheek-teeth shows that the root of Pm_3 is directed very slightly backwards, and reaches scarcely more than half way to the lower margin of the ramus, thus allowing for the incisor to pass underneath. Pm_4 and M_1 are almost straight, and extend to the lower margin of the ramus. The vertical axis of Pm_4 is parallel to that of Pm_3, whereas M_1 diverges somewhat towards the base. M_2 curves backwards at a more oblique angle, whilst M_3, which is again slightly curved, lies with its long axis diverging from the horizontal at an angle of about 20°. In *Ochotona wardi* the third lower pre-molar is shortened, and the growing point of the incisor is at the level of the anterior edge

of Pm_4; M_1 is essentially parallel to Pm_4, whilst the second and third molars are slightly curved and divergent backwards. In *Lepus* the whole of the incisor is in front of Pm_3, which reaches almost to the base of the ramus and forms a second tubercle on the lingual surface, below, and slightly behind that of the incisor. The three molars are all somewhat divergent. In both *Lepus* and *Ochotona* the third lower molar lies back at an angle of 45–50° from the horizontal line of the occlusal level of the tooth-row as a whole.
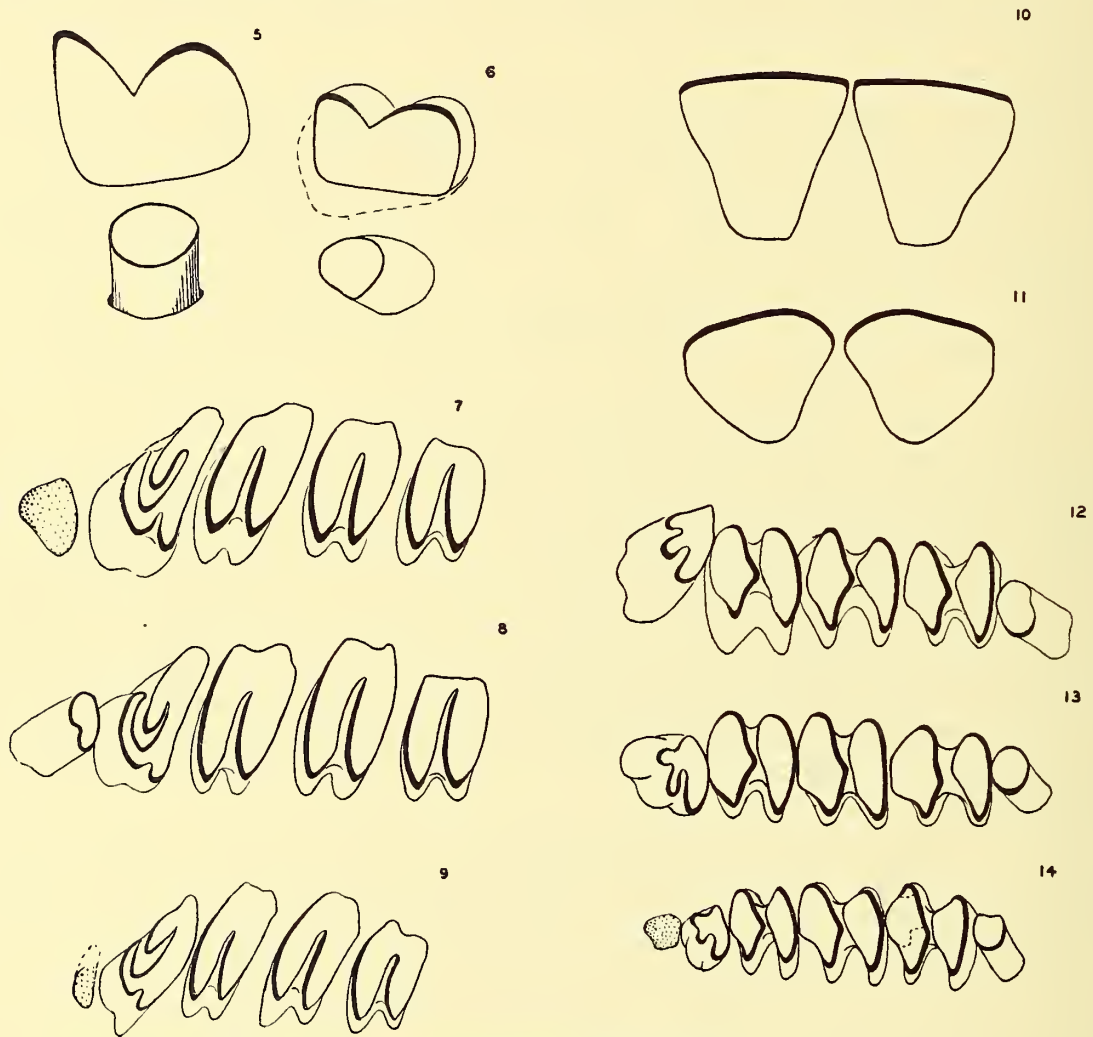
Text-figures 5 to 14, *Kenyalagomys rusingae* and *K. minor*:
FIG. 5. *K. rusingae*: Transverse section of left upper incisors (408 '50). ×10.
FIG. 6. *K. minor*: Transverse section of left upper incisors (holotype 214 '48). ×10.
FIG. 7. *K. rusingae*: Pattern of left upper cheek-teeth (syntype 370 '52). ×5.
FIG. 8. *K. rusingae*: Pattern of left upper cheek-teeth (paratype 793 '47). ×5.
FIG. 9. *K. minor*: Pattern of left upper cheek-teeth (holotype 214 '48). ×5.
FIG. 10. *K. rusingae*: Transverse section of lower incisors (977 and 980 '47). ×10.
FIG. 11. *K. minor*: Transverse section of lower incisors (holotype 214 '48). ×10.
FIG. 12. *K. rusingae*: Pattern of left lower cheek-teeth (syntype 370 '52). ×5.
FIG. 13. *K. rusingae*: Pattern of left lower cheek-teeth (paratype 977 '47). ×5.
FIG. 14. *K. minor*: Pattern of left lower cheek-teeth (holotype 214 '48). ×5.

According to Stromer's figure, in *Austrolagomys* the posterior wall of each lobe in Pm_4–M_2 is smoothly convex, with no trace of the median posterior projection of the trigonid, whilst in M_3 there is a distinct forward projection which is absent in *Kenyalagomys*. The measurements of the lower cheek-teeth of the syntype No. 370 '52, in millimetres, are:

	Pm_3	Pm_4	M_1	M_2	M_3	Pm_3–M_2
Length . . .	1·3	2·3	2·6	2·5	1·0	9·4
Breadth . . .	2·25	2·6	2·75	2·7	1·4	

In addition to the material already described, a further twenty-four specimens are regarded as representing a second, smaller, species of *Kenyalagomys*. The example selected as holotype, although fragmentary, is preserved in good condition, but most of the other specimens are severely abraded by weather action, and the details of the enamel patterns are obscured. It is thus impossible at present to determine to what extent the minor differences of structural detail by which the holotype may be distinguished from *K. rusingae* are constant. For this reason the distinction between the two species is at present based only on size, but the difference is considerably more apparent to the eye than the variation shown in the tables of measurements would suggest.

The holotype of the smaller species includes the horizontal ramus of the mandible, and the lower tooth-row of both sides, and in each case there is a very distinct socket for an anterior tooth immediately in front of Pm_3. This feature is apparently not constant, but of the sixteen mandibular fragments in addition to the holotype the socket for the second pre-molar is present in six examples and absent in four; the remaining six specimens lack the region concerned. In no case is the tooth itself actually preserved, but in one example (No. 16 '48) the root is still present, broken at the gingival level. It is possible that additional material might provide sufficient evidence to justify segregation of two distinct species, one with and one without the second pre-molar, but at present it appears to be wiser to regard the presence or absence of this tooth as a variable character within a single species.

Kenyalagomys minor sp. nov.

(Text-figs. 6, 9, 11, 14)

DIAGNOSIS.—A species of *Kenyalagomys* in which the upper Pm^3–M^2 measures 9·0 mm. or less, and the lower Pm_3–M_2 measures 8·0 mm. or less. A rudimentary lower Pm_2 sometimes present.

HOLOTYPE.—Fragments of the skull and mandible of a single individual (No. 214 '48), comprising part of the left pre-maxilla and maxilla and of both mandibular rami, including a nearly complete dentition in a good state of preservation (Text-figs. 6, 9, 11, 14).

HORIZON.—Lower Miocene.

LOCALITY.—Holotype from site R. 105a; Rusinga Island, Victoria Nyanza, Kenya Colony (Lat. 0° 25′ S.; Long. 34° 9′ E.).

MATERIAL.—In addition to the holotype the species is represented by fragments of

3

seven maxillae and sixteen mandibles from various sites on Rusinga Island, the details of which are as follows :

19 from sites in the Kathwanga series.
3   ,,   ,,   ,,   ,, Upper Hiwegi series.
2   ,,   ,,   ,,   ,, Lower Hiwegi series.
0   ,,   ,,   ,,   ,, Kiahera series.

DESCRIPTION.—The holotype consists of several fragments of a single individual, found in close association with one another in a detached block of matrix. The pre-maxilla and maxilla are disconnected, owing to a fracture just behind the suture, and as a result of slight abrasion of the fractured surfaces the exact point of contact between the two fragments is somewhat obscure. It is clear, however, that the length of the diastema between I^2 and Pm^2 was 9·0–9·5 mm., compared with 12·0 mm. in *K. rusingae*, whilst the total length from I^1–M^2 inclusive is about 23 mm. The exact length of the hard palate is uncertain, but it appears to have been at least 4 mm., and thus relatively longer than that of *K. rusingae*. Apart from the narrow and fragile connecting link between the incisors and the cheek-teeth, practically none of the bone is preserved except the massive anterior part of the zygomatic arch, which appears to be similar in structure to that of the larger species. The large lower branch of the infra-orbital foramen is present, as in *Kenyalagomys*, over the anterior pre-molar, but the upper part of the maxilla is not preserved.

Upper dentition.—The first incisor is broken slightly above the gingival level, and it appears to have been narrower antero-posteriorly than that of *K. rusingae*, with the median groove wider and shallower. The diagram (Text-fig. 6) shows the transverse section of I^1 at the point of fracture, and of I^2 at the occlusal level, but it may be assumed that originally the two came into contact with one another. The second incisor consists of the usual simple peg.

Pm^2 is broken or lost in every specimen so far recovered. The root is still present in three examples, from which it appears that the tooth was much reduced, and considerably more compressed antero-posteriorly than that of *K. rusingae*.

Pm^3 is very similar in general structure to the corresponding tooth of *K. rusingae*, but the postero-external corner is more compressed and pointed, and the whole of the posterior border is distinctly convex, whilst in the larger species it is straight or gently concave.

Pm^4 is completely molarized, and almost identical in structure to M^1—both teeth being essentially similar to the corresponding teeth of *K. rusingae*—consisting of two sub-equal lobes separated by a deep enamel fold from the internal border.

M^2 is also similar to that of the larger species, and resembles a somewhat truncated form of the Pm^4–M^1 pattern. The enamel pattern of the upper cheek-teeth is shown diagrammatically in Text-fig. 9. The measurements of the upper teeth of the holotype, in millimetres, are:

	I^1	I^2	Pm^2 socket	Pm^3	Pm^4	M^1	M^2	Pm^3–M^2
A–p length . . .	1·20	0·85	0·75	1·35	1·50	1·65	1·60	8·0
Tr. breadth . . .	1·90	0·90	1·75	3·25	3·50	3·20	2·80	—

Mandible and lower dentition.—The holotype, although largely embedded in matrix, had suffered extensive post-mortem damage prior to burial, and little more than the solid bone of the ramus surrounding the lower teeth is preserved. The relative depth and thickness appears to have been much the same as in *K. rusingae*, and also the prominence formed by the root of the incisor on the lingual border. All the other examples in the collection had been partially or wholly weathered out of the deposits, and had sustained an even greater degree of damage and corrosion to both bone and teeth.

Lower incisor. The lower incisor is not preserved beyond the alveolus in any specimen, and in some it had been lost immediately after death. The diagram (Text-fig. 11) is taken from the fractured surface of the left lower incisor of the holotype, slightly below the gingival level, and it is possible that the rounded anterior surface and angles might have become modified by the axial twist of the tooth, had the anterior part been preserved.

Pm_2. The crown of this tooth is not preserved in any of the eight examples in which the socket can be seen. In one specimen, however (No. 16. '48), the root is still present, and consists of a simple oval with the longer axis transverse. The average measurements of the sockets are $0·7 \times 0·8$ mm., and the root measures $0·5 \times 0·7$ mm.

Pm_3. In the third pre-molar the general arrangement of the enamel pattern is similar to that of the corresponding tooth of *K. rusingae*, but the enamel folds are relatively shallower, the development of cement appears to be greater, and the proportions of the teeth are somewhat different. Thus, in the four complete examples preserved, the average $\dfrac{\text{Breadth} \times 100}{\text{Length}}$ index is 121, whereas that of eleven corresponding teeth of the larger species is 145. The attrition of Pm_3 is also somewhat different, for whereas in *K. rusingae* the occlusal surface is fairly clearly defined, in *K. minor* there is practically no differentiation—the worn surface merging almost imperceptibly into the lateral walls of the tooth. Indeed the general appearance is of a newly erupted and almost unworn tooth, but in each case the whole of the rest of the tooth-row, including M_3, is fully developed and well worn. No literature is available on the subject of tooth succession in the Ochotonidae, but from personal observations of juvenile examples of *Lepus capensis* it appears that the anterior lower pre-molar normally comes into wear at about the same time as the third molar, or even earlier. It seems improbable that the reverse should be the case in the Ochotonidae, and for this reason the specimens are thought to represent fully adult individuals.

Pm_4. As with the upper teeth, Pm_4 is completely molarized, and almost exactly similar in enamel pattern to M_1 and M_2, consisting of two sub-equal lobes. This is best shown diagrammatically (Text-fig. 14), but it should be borne in mind that the thickened enamel of each posterior wall forms a prominent ridge at a higher level than that of the subsequent anterior wall. Thus the anterior wall of each talonid is almost, if not actually in contact with the enamel of the trigonid, and the apparent gap is due to the different levels, exaggerated in places by the angle of the tooth in relation to the micrometer.

M_3 is reduced to a simple peg, and is not significantly different from that of *K. rusingae* except for size.

The dimensions of the lower teeth of the holotype, in millimetres, are:

	I_1	Pm_3	Pm_4	M_1	M_2	M_3	Pm_3-M_2
Left							
A–p length . .	1·75	1·00	1·70	2·10	2·20	0·80	7·30
Tr. breadth .	2·00	1·10	2·00	2·20	2·10	1·00	—
Right							
A–p length . .	—	1·00	1·65	2·10	2·20	—	7·10
Tr. breadth .	—	1·25	2·00	2·25	2·15	—	—

The following tables compare the measurements of the cheek-teeth in the more complete examples of *K. minor* with those of *K. rusingae*. Measurements are in millimetres throughout.

Upper dentition

	Pm²		Pm³		Pm⁴		M¹		M²		Pm³–M²
	Lgth	Bdth	Lgth	Bdth	Lgth	Bdth	Lgth	Bdth	Lgth	Bdth	Length
K. minor											
214 '48	—	—	1·35	3·25	1·50	3·50	1·65	3·20	1·60	2·80	8·00
371 '48	0·75	1·25	1·75	3·10	1·75	3·50	1·85	3·30	1·75	—	8·50
59 '49	—	—	1·75	2·75	2·00	3·0*	1·75	2·6*	1·80	2·60	9·00
709 '50	—	—	1·75	3·00	1·70	3·50	1·80	3·0*	1·75	3·0*	8·25
1104 '50	0·60	1·00	1·75	3·40	1·70	3·50	1·75	3·25	1·75	2·50	8·25
1439 '50	0·75	1·20	1·60	3·00	1·70	3·25	1·85	—	1·75	2·60	8·10
114 '51	—	—	1·50	3·50	1·60	3·25	1·75	—	1·65	2·50	8·25
1839 '50	—	—	1·50	3·30	1·75	3·10	1·65	3·00	1·70	2·70	8·50
K. rusingae											
697 '47	—	—	2·00	3·50	2·00	3·90	2·20	3·70	2·10	2·75	10·00
793 '47	0·80	1·60	1·75	3·80	2·00	3·90	2·10	3·70	2·00	2·80	9·50
1440 '50	—	—	1·70	3·20	1·90	3·75	2·00	3·60	1·80	3·20	9·20
1443 '50	1·25	1·75	1·90	3·75	2·00	3·75	2·00	3·60	1·80	3·20	9·20
1663 '50	0·80	1·30	1·80	3·5*	2·10	4·20	2·10	3·90	2·00	3·00	9·50
1787 '50	—	—	1·90	3·50	2·00	3·75	2·00	3·80	1·9*	3·0*	9·0*
1867 '50	—	—	1·75	3·60	2·00	3·50	2·00	3·50	1·90	3·20	9·30
2006 '50	—	—	2·00	4·00	2·20	4·50	2·20	4·00	2·00	3·25	9·50
117 '51	—	—	1·90	3·75	2·00	4·00	2·20	3·50	2·10	3·25	9·75
370 '52	—	—	2·00	4·10	2·00	3·75	2·20	3·75	2·00	3·10	9·50

* Indicates that the specimen is damaged and the measurement estimated.

Average measurements of upper teeth

K. minor

Pm²			Pm³			Pm⁴			M¹			M²		
Lgth	Bdth	Ind	Lgth	Bdth	Ind	Lgth	Bdth	Ind	Lgth	Bdth	Ind	Lgth	Bdth	Ind
0·70	1·15	164	1·62	3·16	195	1·71	3·32	195	1·75	3·06	175	1·75	2·67	155

K. rusingae

Lgth	Bdth	Ind	Lgth	Bdth	Ind	Lgth	Bdth	Ind	Lgth	Bdth	Ind	Lgth	Bdth	Ind
0·95	1·55	163	1·87	3·67	196	2·02	3·90	193	2·10	3·70	176	1·96	3·07	156

Lower dentition

	Pm$_3$		Pm$_4$		M$_1$		M$_2$		M$_3$		Pm$_3$–M$_2$
	Lgth	Bdth	Lgth	Bdth	Lgth	Bdth	Lgth	Bdth	Lgth	Bdth	Length
K. minor											
697a '47	1·00	1·25	1·70	1·75	2·20	2·00	2·10	1·90	—	—	7·25
16 '48	1·00	—	1·65	1·65	2·00	1·90	—	—	—	—	—
17 '48	1·00	—	1·85	—	2·25	—	2·40	—	—	1·00	7·75*
214 '48 L	1·00	1·10	1·70	2·00	2·10	2·20	2·20	2·10	0·80	1·00	7·30
214 '48 R	1·00	1·25	1·65	2·00	2·10	2·25	2·20	2·15	—	—	7·10
253 '50	0·80	1·00	1·80	1·60	2·10	1·75	2·00	1·70	—	—	7·20
1940 '50	1·00	—	1·70	1·75	2·00	—	2·00	—	1·00	0·80	8·00
74 '51	—	—	1·80	2·00	2·20	2·25	2·10	2·20	1·00	1·20	—
K. rusingae											
R. s. 19	1·60	2·10	2·10	2·50	2·60	2·70	2·50	2·60	1·20	1·30	9·00
786 '47	1·20	1·80	2·50	2·4*	2·50	2·50	2·70	2·50	1·00	1·00	10·00
973 '47	1·40	2·25	2·25	2·50	2·50	2·60	2·50	2·50	—	—	9·20
977 '47	1·50	2·00	2·25	2·40	2·50	—	2·75	—	0·90	1·25	9·30
980 '47	1·50	2·20	2·25	2·40	2·50	2·50	2·50	—	1·10	1·25	9·20
527 '48	1·75	2·00	2·40	2·40	2·60	2·60	2·50	2·30	1·00	1·30	10·00
472 '49	1·25	1·80	2·25	2·30	2·50	2·40	2·50	2·25	1·20	1·25	9·25
962 '50	1·40	2·30	2·25	2·60	2·50	2·60	2·50	2·50	1·10	1·30	9·25
654 '51	1·40	2·10	2·20	2·50	2·30	2·50	2·50	—	1·00	1·30	8·75
1546 '51	1·50	2·30	2·50	2·50	2·60	2·75	2·70	2·60	0·90	1·20	10·00
370 '52	1·30	2·25	2·30	2·60	2·60	2·75	2·50	2·70	1·00	1·40	9·40

Average measurements of lower teeth

K. minor

	Pm$_3$			Pm$_4$			M$_1$			M$_2$			M$_3$		
	Lgth	Bdth	Ind	Lgth	Bdth	Ind	Lgth	Bdth	Ind	Lgth	Bdth	Ind	Lgth	Bdth	Ind
	0·97	1·15	118	1·73	1·82	105	2·12	2·06	97	2·14	2·01	94	0·93	1·00	107

K. rusingae

	Pm$_3$			Pm$_4$			M$_1$			M$_2$			M$_3$		
	1·44	2·10	145	2·30	2·46	107	2·52	2·59	103	2·57	2·49	96	1·04	1·25	120

Average depth of mandibular ramus

K. minor   At Pm$_3$ At M$_3$
4 examples; 6·5–6·6: Av. 6·52   5 examples; 8·5–9·25: Av. 8·83

K. rusingae
7 examples; 7·25–8·5: Av. 7·92   7 examples; 10·25–12·0: Av. 11·20

DISCUSSION

The distinctions between the Leporidae and the Ochotonidae were clearly tabulated by Bohlin (1942a : 41).   The most doubtful item in his list is No. 7, namely, that the zygoma is a vertically expanded plate in the leporids and a slender rod in the ochotonids.   This statement appears to be taken from Wood (1940: 284), whose remarks on the subject are somewhat ambiguous.   In *Ochotona wardi* the zygoma could hardly be described as a "slender rod", and, to judge by figures in other works, it does not appear to be so in most of the ochotonids.   Apart from this feature the material under consideration agrees fairly well with the ochotonids so far as the characters in Bohlin's table are concerned, but in other respects it shows striking affinities to the leporids.   Among these, the following are the most significant:

1. The degree of maxillary fenestration.
2. The invasion of the dorsal surface of the skull by the supra-occipital.
3. The high occiput.
4. The apparent separation of the lachrymal and orbito-sphenoid by a process from the maxilla and not by one from the frontal.
5. The form of the coronoid process and the anterior wall of the ascending ramus.
6. The size and shape of the masseteric fossa.

Kenyalagomys also exhibits certain features that may be regarded as more primitive, or perhaps intermediate between the two groups, such as the parallel nasals; the degree of hypsodonty, and the retention of a median septum separating the anterior palatal fenestrae.

Although Bohlin's table is a most useful guide, it must be borne in mind that the two families probably originated from a common stock which could not be assigned to either of them.   Moreover, after giving rise to the known families, the common stock may have survived in a modified form that not only retained certain primitive characters but also developed a mixture of others which, taken individually, are now regarded as diagnostic of either the leporids or the ochotonids, or are common to both.   In the absence of pre-Miocene African ancestors of *Kenyalagomys* there is no justification for assuming that this genus represents an intermediate group, and the weight of evidence appears to indicate that it should be referred to the Ochotonidae as a somewhat generalized genus in which both primitive and specialized features are combined.

The most nearly related genus appears to be *Austrolagomys*, from which the new genus is separated on account of the following differences in dentition:

1. In the second upper premolar there is a distinct shallow fold on the anterior surface, whereas in *Austrolagomys* the anterior surface is convex.
2. In the third upper premolar the deep, narrow, V-shaped fold of the external enamel commonly present in the Ochotonidae is well developed, whereas, if Stromer's description and figures are accurate, it is absent in *Austrolagomys*.
3. The deep fold of the internal enamel (the "hypostria" of Wood and others) extends further towards the outer surface.
4. In the third lower premolar the external enamel fold is much deeper in *Kenyalagomys*.

5. In the fourth lower premolar and first and second molars the posterior wall of each trigonid is produced sharply backwards at the mid point, to meet the anterior wall of the talonid. In *Austrolagomys* the posterior wall of each lobe forms a smooth curve, slightly convex backwards.

In addition to the dental characters, the ascending ramus of the mandible is more vertical in *Kenyalagomys*, and it appears that the occipital region of the skull is also more vertical, but Stromer's description of the skull of *Austrolagomys* is too brief for any detailed comparison to be made.

The presence of ochotonid remains in the Miocene deposits of both East and South West Africa indicates that the group must have become established in the African continent at some earlier period, probably during the Oligocene. *Kenyalagomys* has retained certain characters that may be regarded as primitive, such as the presence of Pm_2 in *K. minor*, but other features are developed to a higher degree of specialization than in some of the Recent species of *Ochotona*.

The evidence of the fauna as a whole suggests that a variety of conditions was available in the area during Miocene times, and that it was not unlike the country around the south-eastern portion of Lake Victoria today—namely open plains of grass and scrub; riverine belts of trees and forest patches, and swampy conditions along the lake shore. The ochotonids probably lived in the plains areas, and if the climatic conditions of the period were in any way similar to those of the present day, for a large part of each year much of their vegetable diet would have been dry and tough. This might have resulted in specialization of certain characters such as the increased hypsodonty of the teeth to a greater degree than in their northern relatives. In times of spate their remains would be washed into the rivers by flood waters, to be carried down towards the lake, and subsequently incorporated in the estuarine and lacustrine sediments of the period.

Pleistocene Lagomorpha

A number of specimens from the Laetolil area in Tanganyika Territory are in the Department of Geology of the British Museum (Nat. Hist.). Most of the material was obtained by the East African Archaeological Expedition of 1935 from the Pleistocene deposits around the north-eastern end of Lake Eyasi, from which the original material, collected by Kohl-Larsen and described by Dietrich (1942), was obtained. A few other fragments from the Pleistocene deposits of Kanjera, on the southern shore of the Kavirondo Gulf of Lake Victoria, are also in the British Museum.

Family LEPORIDAE

Genus *SERENGETILAGUS* Dietrich

Serengetilagus praecapensis Dietrich

(Text-figs. 16, 21, 23)

TYPE LOCALITY.—The area round the NE end of Lake Eyasi, Tanganyika Territory: 3° 20'–30' S.; 35° 10'–20' E.

MATERIAL.—(British Museum Numbers).

M. 15118a, b & c.	Three mandibular rami; Pm$_3$–M$_3$.
M. 15119.	Two maxillae; Pm^2–M^3.
M. 16512.	One maxilla; Pm^3–M^2.
M. 16513.	Six mandibular rami.
M. 16514.	Five ,, ,,
M. 16515.	One head of a humerus.
M. 16520.	Two calcanei.
M. 16521.	One shaft of a tibia with distal end.

The material agrees very closely with Dietrich's description and figures of *Serengetilagus praecapensis*, and there can be no doubt that it belongs to the same species.

DESCRIPTION.—*Maxillae and upper dentition.* The two fragmentary maxillae (M. 15119) probably belonged to a single skull, but there is no point of contact between them. Both these and the third maxilla are very incomplete, and show no unusual features.

In each specimen the anterior pre-molar (Pm^2) is broken at the gingival level, but the enamel pattern can be clearly seen in transverse section on the broken surface. The tooth is somewhat less compressed from front to back than that of *Lepus capensis* L., but the enamel folding is similar in arrangement.

Pm^3 and Pm^4 are molarized, and have a deep invagination of the enamel from the inner border extending rather more than half way across the tooth. The enamel of this fold shows slight wrinkling along the anterior edge, whilst that of the posterior arm is simple. Pm^4 is the widest tooth in the series; a condition commonly found in *Lepus*.

M^1 and M^2 are practically similar to the two posterior pre-molars, but M^3 is reduced to a simple peg which is oval in transverse section. The general enamel pattern of the upper teeth is shown diagrammatically in Text-fig. 16.

The total length of the upper tooth row can only be estimated, owing to the fracture of Pm^2 in each case, but from the curvature of the root it is clear that it must have come almost into contact with Pm^3 at the occlusal surface. This would give a total length of ±14 mm. at the occlusal surface, and 16·25 mm. at the alveolar level. The individual measurements of the upper teeth in millimetres, compared with those of a sub-adult example of *L. capensis*, are:

	S. praecapensis.		*L. capensis.*	
	Length	Breadth	Length	Breadth
Pm^2 .	. 1·8	3·25	1·6	3·25
Pm^3 .	. 2·25	4·5	2·3	4·75
Pm^4 .	. 2·6	4·75	2·3	4·75
M^1 .	. 2·4	4·25	2·25	4·5
M^2 .	. 2·1	4·0	2·2	4·25
M^3 .	. 0·7	1·75	0·8	1·75

Mandible and lower dentition.—The most complete mandibular fragment is broken anteriorly just behind the alveolus of the incisor, and posteriorly immediately

behind M_3. The structure of the ramus is very similar to the example figured by Dietrich (1942, pl. 3, fig. 19). The depth of the horizontal ramus is 12 mm. at Pm_3, and 16 mm. at M_3, and is thus almost exactly similar to the average depth in *L. capensis*. Dietrich made no mention of the backward extension of the lower incisor root, but in all the specimens under consideration in which this feature is preserved, the base of the incisor forms a distinct tubercle on the lingual surface of the ramus below the middle of Pm_3. In the modern *L. capensis* the incisor arises from a point below the front of Pm_3, and does not overlap the cheek-teeth.

Pm_3. As Dietrich showed, the enamel folding of the anterior lower pre-molar is somewhat variable. In the usual arrangement (Text-fig. 21) the enamel of the anterior border has a slight median indentation. The labial border has a wide, shallow fold anteriorly, and a deep narrow fold just behind the middle line. This main fold extends approximately half way across the tooth, and differs from the corresponding fold in Pm_3 of *Lepus*, in which it normally reaches almost to the enamel of the inner surface. The remainder of the tooth has a simple wall of thin enamel, sometimes with a trace of a fold on the lingual border slightly in front of the middle line. This tooth is preserved in twelve of the fourteen mandibular fragments, and the internal fold is present in five examples. In one of the latter it extends across about one-third of the occlusal surface (Text-fig. 23), but in some of the others it is little more than a slight indentation of the enamel wall. Dietrich drew particular attention to one of his original specimens in which a median internal fold is present, extending nearly half way across the tooth and almost uniting with the main labial fold. It is clear from his pl. 3, fig. 18 (1942) that a second antero-internal fold was indicated, and it is interesting to note that his figure of the tooth shows a condition somewhat similar to that found in the corresponding tooth of *Pronolagus*, in which the main labial and lingual folds meet (Text-fig. 22), although in other respects the teeth show no great similarity. In the fossil under consideration (Text-fig. 23) the internal fold appears to correspond to the main internal fold of Dietrich's specimen, but is slightly more forward in position. In the remaining seven examples of this tooth in the present collection there is no trace of any internal folding.

Pm_4 is molarized, as in the upper tooth-row. It consists of two sub-equal lobes separated by a deep enamel fold extending from the external wall almost to the inner border. The enamel is thickened on the external angles and on the anterior wall of the main fold. Elsewhere it is very thin and unwrinkled.

M_1 and M_2 are almost identical in structure to Pm_4, whereas M_3 is composed of two distinct enamel pillars united by cement. The enamel pattern of the lower cheek-teeth is shown diagrammatically in Text-fig. 21. The measurements, in millimetres, compared with those of *L. capensis* are:

| | *S. praecapensis* | | *L. capensis* | |
	Length	Breadth	Length	Breadth
Pm_3	3·25	3·0	3·3	3·5
Pm_4	2·9	3·25	2·55	3·5
M_1	3·0	3·0	2·75	3·3
M_2	2·8	3·1	2·65	3·3
M_3	2·0	1·75	1·5	1·5

Post-cranial skeleton.—In addition to the mandible and maxilla fragments, parts of two limb bones and two tarsals appear to belong to the same species.

The head of a humerus of an adult animal is distinctly smaller than that of a sub-adult example of *L. capensis* in which the proximal epiphysis is incompletely fused. The articular surface of the head extends on to the upper surface of the lesser tuberosity, as in the recent animal, but the greater tuberosity is somewhat less developed.

The shaft of the tibia is more slender than that of *Lepus* although similar in structure. It agrees almost exactly with that figured by Dietrich (1942, pl. 3, fig. 24) both in size and proportions.

The calcaneum is slightly smaller than that of *Lepus*, but the facet for the fused distal end of the fibula is relatively larger.

It would appear from these fragments that *Serengetilagus praecapensis* was equivalent in size to a small example of *Lepus capensis*, but was of a more slender build.

Genus *LEPUS* Linnaeus

Lepus veter sp. nov.

(Text-figs. 15, 18, 19, 24)

DIAGNOSIS.—A species of *Lepus* equivalent in size to a large *L. capensis* or *L. europaeus* but more heavily built: teeth with a more complex enamel pattern: anterior flange of angular process of mandible more pronounced and displaced laterally.

HOLOTYPE.—A right horizontal mandibular ramus, bearing all the cheek-teeth, but lacking the incisor (Text-figs. 15 & 24).

PARATYPES.—Parts of a left maxilla and mandible. (M.15868, B.M.G.D.)

HORIZON.—Upper Middle Pleistocene.

LOCALITY.—Type: Chianda-Uyoma, Kavirondo Gulf, Kenya Colony. Lat. 0° 15′ S.; Long. 34° 20′ E. Paratype: Kanjera; 12 miles ESE of type locality.

MATERIAL.—The holotype and paratypes; the proximal end of a left ulna; right metatarsal IV and V, and the shaft of Mt. III.

DESCRIPTION.—(1) *Holotype.*—The body of the ramus is slightly deeper and more massive than that of modern examples of *L. capensis*. As in the existing species, the mental foramen is situated about 4 mm. in front of the first of the pre-molar series, and very near the upper surface of the bone. Behind it is an irregular cluster of subsidiary foramina, similar to that found in many examples of the Recent species. Another complex series of foramina is situated on the lower border of the ramus immediately behind the alveolar margin of the incisor. The anterior flange of the angular process arises from the base of the ramus below the third molar, and although it is more massive than that of *L. capensis*, it does not project so far downwards, but is more laterally splayed. The anterior edge of the ascending ramus begins to rise immediately behind the third molar, and the beginning of the outer flange which gives rise to the coronoid process is also visible. A branch of the mandibular foramen penetrates the inner flange, and a second branch, lying immediately below the first, leads into the body of the horizontal ramus.

The base of the incisor socket forms a distinct swelling on the lingual surface below the anterior border of Pm$_3$, as in the modern Hare; it does not extend back to

overlap the pre-molar as appears to have been the case in *Serengetilagus*.   Pm$_3$ is curved from base to apex—concave on the lingual side—and forms a pronounced tubercle near the base of the lingual surface of the ramus below and behind that formed by the root of the incisor.   The roughened surface of the symphysis extends over this swelling, as in fully adult specimens of *L. capensis.*

Pm$_3$ has a very short anterior border from which a deep, narrow fold extends back almost to the middle of the anterior lobe.   This fold is entirely filled with cement, and is very slightly bifurcate at its posterior extremity.   The lingual and posterior surfaces of the tooth are smoothly convex, with no enamel folds; their general axes lie approximately at right-angles to one another.   The tooth is divided into two main lobes by a deep transverse fold which penetrates from slightly behind the middle of the outer surface almost to the lingual enamel wall.   The outer surface of the anterior
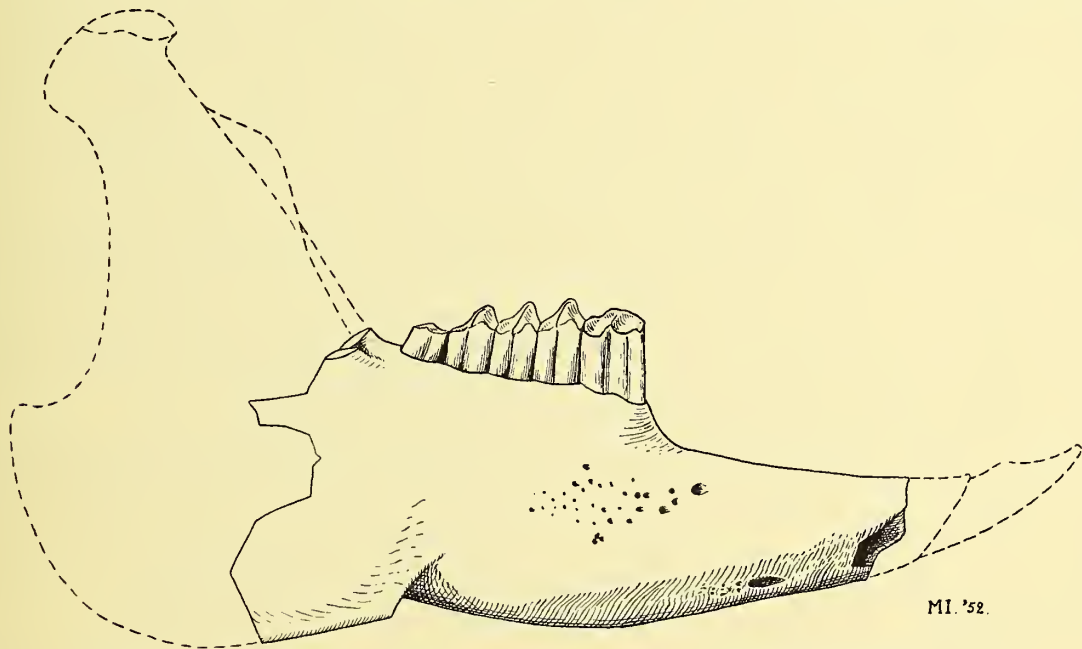

FIG. 15.   *Lepus veter*: Holotype.   Right mandibular ramus; labial aspect.   ×2.

lobe is again broken by a rather wide, shallow fold, and the external wall thus comprises three prominent, vertical enamel ridges, with the intervening spaces filled with cement.   The anterior enamel wall of the main transverse fold is very thick, and has two subsidiary folds; one in the middle, projecting forwards towards the bifurcated fold from the anterior surface, and a second slightly nearer to the labial border, projecting backwards.   The latter feature is reproduced, though becoming progressively weaker, in the next three teeth.   The inner end of the main transverse fold is damaged, but it appears to have bent sharply forwards as in the succeeding teeth. The enamel is again very thick on the three external "pillars", but the remainder is thin and somewhat wrinkled, particularly on the posterior wall of the transverse fold, where it appears on the worn surface as an extremely fine, wavy line.   The posterior lobe of the tooth is a simple oval, and is broader than the anterior lobe.

A lower Pm$_3$ of *L. capensis* was sectioned at approximately 1 mm. intervals from

4*

the occlusal surface downwards, in order to determine whether or not the enamel pattern changes radically as the tooth becomes more worn. Diagrammatic representation of these transverse sections is shown in Text-fig. 26 a-g, which indicate that the shape of the main transverse fold alters to some extent by exaggeration of the form of its anterior wall. At the same time the posterior lobe of the tooth becomes relatively reduced. On the other hand the general external enamel pattern is scarcely affected, and the degree of wrinkling of the thinner enamel walls remains unchanged.

Pm_4 is molarized, and similar to M_1 and M_2 in general structure, consisting of two lobes separated by a median transverse fold. The anterior border of the first lobe has a slightly convex margin, whereas the posterior border of the lobe has a backward projection a little to the outside of the mid point. This corresponds to the similar fold in Pm_3, already described, and becomes less pronounced towards M_2. The anterior lobe is considerably broader than the posterior, and the outer angle is sharply compressed, but the inner angle is more rounded. The median transverse fold extends right across the crown; it curves sharply forwards just inside the surface enamel at the inner end of the anterior lobe. As in the modern Hare, this double thickness of enamel at the inner ends of the anterior lobes is affected more slowly by normal wear than the rest of the crown, and thus produces the characteristic series of conspicuous peaks along the inner border of the tooth-row. The enamel of the anterior wall of the median transverse fold is again very thick and forms a pronounced ridge across the crown, but that of the posterior wall of the fold is extremely thin and wavy. The outer corners of the posterior lobes are compressed and project outwards approximately to the same extent as the corresponding angles of the anterior lobes. On the lingual side, however, the posterior lobes are shortened, and stand well back from the line of the antero-internal corners of the anterior lobes.

In M_3 the transverse fold extends right across the crown, dividing the tooth into two distinct pillars, united by cement. The anterior pillar is broader and somewhat kidney-shaped, with the concave border to the back; the posterior pillar is transversely oval. The enamel pattern of the lower cheek-teeth in the holotype is shown diagrammatically in Text-fig. 24, compared with that of *L. capensis* (Text-fig. 25).

(2) *Paratypes.*—A fragment of maxilla bearing $Pm^2–M^1$, and a mandibular ramus, both from the left side and possibly belonging to a single individual, are regarded as paratypes. These examples, together with a few other fragments described below, were obtained from deposits of similar age at Kanjera, about 12 miles from the site of the holotype.

The teeth are somewhat damaged, and are affected by a deep black stain which partially obscures the enamel pattern. For this reason the Chianda-Uyoma specimen, in which the structure is more readily visible, was chosen as the holotype.

The mandibular fragment is slightly more slender than the holotype, and may represent a different sex, but in other respects it is so similar that no further description is necessary. The lower incisor is broken at the gingival level, and in transverse section it can be seen that the antero-medial angle of the tooth is very pronounced, and forms a distinct ridge along the anterior surface, which appears to be slightly concave in consequence. The enamel pattern of the cheek-teeth is similar to that of the holotype.

The fragmentary maxilla (Text-fig. 19) bears a small part of the hard palate, the

anterior edge of which is situated opposite the junction between the second and third pre-molars. Posteriorly the inward flange of the palate arises above the M^{1-2} junction, and forms a more or less gradual curve to the mid-line, whereas in *L. capensis* (Text-fig. 20) it arises in a very sharp curve at the level of Pm^4–M^1. The antero-posterior measurement is 7 mm., compared with 5·5 mm. in the Recent species. On the external surface of the maxilla the anterior part of the zygomatic arch, which is distinctly more massive than that of *L. capensis*, is preserved. The anterior point is also more pronounced, and extends rather further forward (Text-figs. 19, 20).

Pm^2 is almost trapezoidal in outline, whereas in *L. capensis* it is oval, and the tooth is further distinguished by having three sub-equal invaginations of the enamel of the anterior wall. In this respect the tooth bears a certain resemblance to that of *Lepus wongi* Young from Choukoutien (see Bohlin, 1942*b*: 135).

Pm^3 and Pm^4 are molarized, and the wrinkling of the enamel in both the anterior and posterior walls of the main transverse fold is very complex. In M^1 this is rather less pronounced in the posterior wall, but in other respects the tooth is very similar to the pre-molars. The enamel is thickened in the anterior walls of the teeth, and at the internal angles of each lobe, whilst that of the outer and posterior walls is extremely thin. The enamel of the main transverse fold is intermediate in thickness, and there is no appreciable difference between the two walls. Only a small portion of M^2 is preserved, and M^3 is missing. The enamel pattern of the upper cheek-teeth is shown diagrammatically in Text-fig. 18, compared with *L. capensis* (Text-fig. 17). In *Lepus* (*capensis* and *europaeus*) the long axis of each tooth is approximately at right-angles to the middle line of the skull, whereas in the fossil under consideration they are somewhat oblique, with the long axis directed slightly backwards from the mid line. The teeth are also relatively broader than those of *L. capensis*. The measurements of the teeth of the holotype and paratypes, in millimetres, compared with similar measurements of a fully adult example of *L. capensis*, are:

	Lower dentition						Upper dentition			
	Holotype		Paratype		*L. capensis*		Paratype		*L. capensis*	
	Lgth	Bdth	Lgth	Bdth	Lgth	Bdth	Lgth	Bdth	Lgth	Bdth
Pm^2	.						2·25	4·25	2·1	4·0
Pm^3	. 4·1	3·9	4·25	4·0	3·5	3·4	2·7	5·8	2·4	5·0
Pm^4	. 3·2	4·2	3·0	4·0	2·8	3·7	2·7	5·5	2·5	4·8
M^1 .	. 3·1	4·0*	3·1	3·75	3·0	3·5	2·5	5·25	2·25	4·5
M^2 .	. 3·0	3·8	3·0	3·5*	2·8	3·4	—	—	—	—
M^3 .	. 2·2	2·0	2·25	2·0*	1·8	1·8	—	—	—	—··

Mandibular measurements

	Holotype	Paratype	*L. capensis*
Alveolar length: Pm_3–M_3	. 17·8	18·0	16·5
Depth of ramus at Pm_3	. 14·0	13·75	13·5
Depth of ramus at M_3 .	. 17·0	—	15·5
Thickness of ramus at M_1	. 7·0	6·0	5·75
Length of diastema .	. —	21·0	20·0

* Indicates that the measurement is estimated.
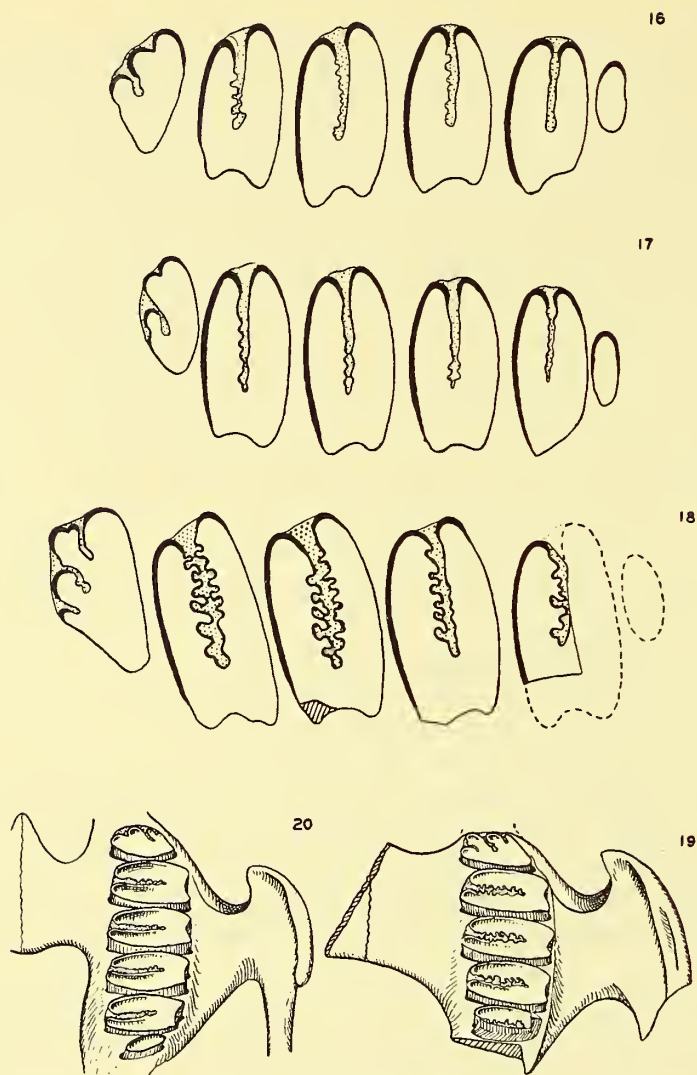
FIG. 16. *Serengetilagus praecapensis*: Right upper cheek-teeth (M.15119). ×5.
FIG. 17. *Lepus capensis*: Right upper cheek-teeth. ×5.
FIG. 18. *Lepus veter*: Upper cheek-teeth (paratype M.15868; left side reversed). ×5.
FIG. 19. *Lepus veter*: Left maxilla (paratype M.15868). ×2.
FIG. 20. *Lepus capensis*: Left maxilla. ×2.

Parts of four bones of the post-cranial skeleton found at Kanjera with the paratypes may have belonged to the same animal.

A fragment of the left ulna consists of the olecranon process; the sigmoid notch and a small portion of the shaft. It is relatively more massive than the ulna of *L. capensis*, and the shaft appears to have been nearly straight, lacking the conspicuous forward curve found in the corresponding bone of the modern Hare. The olecranon is about the same length, but considerably deeper (11·25 mm.) and thicker (5.25 mm.) than that of *L. capensis*, in which these measurements are 9·5 mm. and 3·75 mm. respectively. The groove to accommodate the triceps tendon at the posterior end is more distinct, and the lower surface of the shaft is more rounded.

FIG. 21.   *Serengetilagus praecapensis*: Right lower cheek-teeth (M.15118 b).   ×5.
FIG. 22.   *Pronolagus*: Right lower cheek-teeth.   ×5.
FIG. 23.   *Serengetilagus praecapensis*: Right lower Pm₃ (M.15113).   ×5.
FIG. 24.   *Lepus veter*: Right lower cheek-teeth (holotype).   ×5.
FIG. 25.   *Lepus capensis*: Right lower cheek-teeth.   ×5.
FIG. 26.   *Lepus capensis*: (a) Right lower Pm₃; occlusal surface.   ×5.   (b to g).   Transverse   sections
        of (a) at approximately 1 mm. intervals downwards from the occlusal surface.   ×5.

Metatarsals IV and V are preserved complete, but the shaft of Mt. III has lost both articular ends.   They are somewhat larger than those of *L. capensis*, but they appear to be almost identical in structure.   The proximal end of Mt. IV is relatively broader, but the form of the tarsal facets suggests that the tarsus was exactly as in *L. capensis*.

CONCLUSIONS

From the study of these remains it appears that *Lepus veter* was equal in size to a large example of *L. capensis*, or perhaps a trifle larger.   On the other hand the stoutness of the bones indicates that the animal was heavier and less well adapted to the generally dry habitat of the modern species.

The deposits from which these fragments were obtained were laid down during the Kanjeran (Upper Kamasian) pluvial, towards the end of the middle Pleistocene. Other mammalian fossils from the same horizon include *Stylohipparion*, *Notochoerus*, *Mesochoerus* and *Palaeoloxodon*, all of which may be regarded as having lived in a comparatively damp habitat, and certainly not under arid conditions.

The greater complexity of the teeth of *L. veter* as compared with *L. capensis* suggests a somewhat greater degree of specialization, and since it is unlikely that the complex pattern reverted to the simpler pattern, it follows that *L. veter* probably did not give rise to the modern species, but developed along slightly different lines. Possibly it became extinct because it was unable to adapt itself to the increasingly arid conditions that prevailed during the Kamasian-Gamblian inter-pluvial.

REFERENCES

BOHLIN, B.   1942*a*.   The Fossil Mammals from the Tertiary Deposits of Taben-Buluk, Western Kansu. *Sino-Swed. Exped.*, Stockholm, 6, 3: 113 pp., 1 pl.   (*Palaeont. sinica* (n.s.) C, 8a.)

—— 1942*b*.   A Revision of the fossil Lagomorpha in the Palaeontological Museum, Upsala.   *Bull. geol. Instn. Univ. Upsala*, 30: 117–154, 21 figs.

CLARK, W. E. LE G. & LEAKEY, L. S. B.   1951.   *Fossil Mammals of Africa*, 1.   *The Miocene Hominoidea of East Africa.*   117 pp., 9 pls.   Brit. Mus. (Nat. Hist.), London.

DIETRICH, W. O.   1942.   Altestquartäre Säugetiere aus der Südlichen Serengeti, Deutsch-Ostafrikas. *Palaeontographica*, Stuttgart, 94, A: 43–133, pls. 2–23.

SHACKLETON, R.   1951.   A contribution to the geology of the Kavirondo Rift Valley.   *Quart. J. Geol. Soc. Lond.*, 106: 345–392, pls. 23–28.

STROMER, E.   1926.   Reste Land- und Süsswasser-bewohnender Wirbeltiere aus den Diamantfeldern Deutsch-Südwestafrikas.   *In* Kaiser, E. *Die Diamantenwüste Südwest-Afrikas*, 2: 107–153, pls. 40–42.

THOMAS, O. 1919.   The Method of taking the Incisive Index in Rodents.   *Ann. Mag. Nat. Hist.* (9) 4: 289–290.

WOOD, A. E.   1940.   The Mammalian Fauna of the White River Oligocene, Part III.   Lagomorpha. *Trans. Amer. Phil. Soc.*, Philadelphia (n.s.) 28: 271–362, pls. 34, 35.

—— 1942.   Notes on the Paleocene Lagomorph, *Eurymylus*.   *Amer. Mus. Novit.*, New York, 1162: 1–7.

EXPLANATION OF PLATE

PLATE 1

EXPLANATION OF PLATE 1

Kenyalagomys rusingae gen. et sp. nov.

FIG. 1. Syntype No. 370 '52. Left lateral aspect. ×2. The one conspicuous molar is M¹ of the right side, partially displaced.

FIG. 2. Syntype No. 370 '52. Palatal aspect. ×2. The septum separating the palatal fenestrae is not preserved in this specimen.

FIG. 3. Syntype No. 592 '52. Left lateral aspect. ×2.

FIG. 4. Syntype No. 592 '52. Dorsal aspect. ×2. The matrix was not removed from the inside of the zygomatic arch, which would otherwise have been too fragile. The apparent thickness of the malar is thus considerably exaggerated.

FIG. 5. Syntype No. 592 '52. Ventral aspect. ×2. The photograph was taken at an oblique angle in order to show the inter-fenestral septum, and the specimen is thus somewhat foreshortened.

FIG. 6. Syntype No. 592 '52. Occipital aspect. ×2.

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PLATE I

KENYALAGOMYS